SECURE RESEALABLE CONTAINER CLOSURE

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ABSTRACT

A closure including a crown member, a base member attached to the crown member, the base member having a partially frangible member and a tap member retained by the crown member and base member. The crown member is configured to move axially with respect to the base member.
Rotate crown member 700

Depress crown member 710

Pierce partially-frangible member 720

Release contents of container 730

Fig. 7
SECURE RESEALABLE CONTAINER CLOSURE

BACKGROUND

[0001] 1. Field

[0002] The disclosed embodiments relate to container closures and, more particularly, to resealable container closures.

[0003] 2. Brief Description of Related Developments

[0004] Conventional methods for tampering a resealable container closure such as a pull/push top closure include wrapping the top of the closure with some kind of material. For example, conventional pull/push top closures are wrapped with a plastic shrink-wrap or cellophane. When the wrapping is removed or partially removed a consumer knows that the top and possibly the contents of the container the top is affixed to have been tampered with. During transport of the containers the shrink-wrap or foil over the pull/push top closures may become damaged and/or torn off leading a consumer to think the container has been tampered with or becomes removed entirely which leaves no indication that the package may have been tampered with.

[0005] Other tamper evident features used in conventional pull/push top closures include foil over the bottle openings and frangible security rings that separate from the cap as the cap is twisted or unscrewed off a container. Having tamper features that are separate from the container closure add another step to the processing of the container and its contents and are not readily visible at time of purchase.

[0006] It would be advantageous to have a pull/push container closure with an integral security/tamper evident feature.

SUMMARY

[0007] In one aspect, the disclosed embodiments relate to a method for opening a closure. The method includes rotating a crown member of a closure, depressing the crown member toward a base member of the closure and piercing at least one frangible segment of a partially frangible member of the base member.

[0008] In another aspect, the disclosed embodiments relate to a closure system. In one embodiment, the closure system includes a crown member, a base member attached to the crown member, the base member having a partially frangible member and a tap member retained by the crown member and base member. The crown member is configured to move axially with respect to the base member.

[0009] In a further aspect, the disclosed embodiments relate to a closure system. In one embodiment, the closure system includes a base member and a crown member slidably engaged with the base member. The crown member is configured to drive a tap member through a partially frangible member of the base member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The foregoing aspects and other features of the disclosed embodiments are explained in the following description, taken in connection with the accompanying drawings, wherein:

[0011] FIG. 1 illustrates a closure assembly in accordance with an exemplary embodiment;

[0012] FIG. 2 illustrates an exploded view of the closure assembly of FIG. 1;

[0013] FIG. 3 shows a sectional view of a closure in accordance with an embodiment;

[0014] FIG. 4 shows a sectional view of the closure in FIG. 3 in an actuated closed configuration;

[0015] FIG. 5 illustrates a sectional view of the closure in FIG. 3 in an open configuration;

[0016] FIG. 6 shows an exploded sectional view of the closure of FIG. 3 in accordance with an embodiment;

[0017] FIG. 7 shows a flow diagram in accordance with a method of an exemplary embodiment;

[0018] FIGS. 8A and 8B illustrate an exploded sectional view of a closure in accordance with an embodiment;

[0019] FIG. 9 shows a cut-away isometric view of the closure in FIGS. 8A and 8B in accordance with an embodiment in a first configuration; and

[0020] FIG. 10 shows a cut-away isometric view of a closure FIGS. 8A and 8B in accordance with an embodiment in a second configuration.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENT(S)

[0021] FIG. 1 illustrates a closure in accordance with an exemplary embodiment. Although aspects of the invention will be described with reference to the embodiments shown in the drawings and described below, it should be understood that these aspects could be embodied in many alternate forms of embodiments. In addition, any suitable size, shape or type of elements or materials could be used.

[0022] The resealable pull-up style closure assembly 1 shown in FIG. 1 may include a crown assembly 4 and a base or bottom member 2. The crown assembly 4 may generally include a crown or top member 5, a tamper evidence band 6 and a tap member 3. It is noted that the embodiments described herein may be employed not just for the beverage industry but with other industries as well. These other industries include, for example, the personal hygiene industry (e.g. mouthwash, shampoo, etc.), the home and auto industry (e.g. cleaning products, air fresheners, etc.), the food industry (e.g. condiments, sauces, spices, seasonings, etc) and chemical and pharmaceutical industries (e.g. reagents, dietary supplements, etc.). The closure may have any suitable shape corresponding to, for example, the mouth or opening of an attached container.

[0023] Referring now to FIGS. 2 and 3, the base member 2 of the closure assembly 1 may include a top face 12 having skirt 7 extending therefrom in a longitudinal direction that extends from the top of the closure assembly 1 to the bottom of the closure assembly 1. In alternate embodiments, the base member 2 may also include a tamper evidence feature, that may be similar to the band 6, or any other suitable tamper evidence feature that engages the container to indicate whether the closure 1 has been removed from the container. In the figures the skirt 7 is shown as being cylindrical or having a circular cross-section but in alternate embodiments, the skirt 7 may have any suitable shape such as, for example, square, rectangular, triangular, oval, etc. The skirt 7 may have an opening forming a cavity so that the closure assembly 1 can be removably engaged with a container. The cavity of the skirt 7 may have any suitable features to affix the closure 1 to a container such as, for example, thread elements 39. In alternate embodiments, the closure assembly 1 may be attached to a container in any suitable manner, such as for example, with snaps, locking tabs and the like. In other alternate embodiments, the base
member 2 may have contact portions to substantially seal between the closure assembly 1 and the container. In still other alternate embodiments, the crown member 5 may be removably engaged to the container while the base member 2 remains affixed or is of unitary construction with the container.

[0024] Opposite the skirt 7, the base member 2 may also include a skirt extension 43 extending longitudinally from the top face 12 towards the top of the closure 1. The skirt extension 43 is shown in the drawings as being cylindrical (e.g., with a circular cross-section) but in alternate embodiments, the skirt extension 43 may have any suitable cross-sectional shape such as square, rectangular, triangular, oval, etc. The skirt extension 43 may include a partially frangible member 8 having partially frangible segments 9 with fragement pathways 11. The partially frangible segments 9 may be initially pierced by a fragement wedge 24 of the tap 3 and further split by the continued advancement of the tap 3 and crown 5 in the direction of arrow A towards the face 12 of the base 2. Split segments 9 of the frangible member 8 may remain attached to the base member 2 via a living hinge 10 (See also FIG. 4) while not interfering with the release of the container contents through the closure assembly 1. In alternate embodiments, the partially frangible segments 9 may be contained from being released into the contents of the container in any suitable manner. The skirt extension 43 may also include a tamper evidence band 13 for retaining the tamper evidence band 6 as will be described below and a ramped surface 16 which may aid in the assembly of the closure 1.

[0025] The skirt extension 43 may contact a portion of the tap 3 and/or other alignment portion of the crown member 5 and provide retention and guidance of the crown member 5 before, during and after actuation. The inner surface of the extension 43 above the surface 12 of the base member 2 may include a ledge 19 and rotation resistance features 17 which may retain the tap 3 until deliberate actuation. In alternate embodiments, retention of the tap may be provided in any suitable manner. Longitudinal grooves 18 on the inner surface of the extension 43 may guide the tap 3 during engagement and piercing of the partially frangible member 8. A groove 20 on the skirt extension 43 may retain the tap flange 21 upon actuation as shown in FIG. 5. In alternate embodiments, the tap flange 21 may be retained in any suitable manner such as for example, by snaps.

[0026] The tap 3 may include a wall 29 which may be notched 25 at the end engaging the partially frangible member 8 and is bridged 26 at the opposite end with a stopper feature 27 projecting above the bridge 26. The wall 29 is shown in the Figures as being cylindrical (e.g., with a circular cross-section) but in alternate embodiments, the tap wall may have any suitable cross-sectional shape such as square, rectangular, triangular, oval, etc. The wall 29 may provide a channel 28 for the contents of a container to pass out of the container closure 1. A flange 21 perpendicular to and positioned along the longitudinal axis of the tap 3 may be seated on ledge 19 of the base member 2 before actuation and retained after actuation in the groove 20. Tabs 22 projecting radially from the flange 21 may engage a rotation-resistance feature 38 on the base member 2 before actuation and engage longitudinal grooves 18 in the base member 2 when the tap is advanced longitudinally in the direction of arrow A (towards the surface 12 of the base member 2) to puncture the frangible member 8. Longitudinal ribs 23 project upward from the flange 21 to provide orientation and alignment of the crown member 5 when opening the closure 1 to release the container contents or when resealing the closure 1. In alternate embodiments, orientation and alignment of the crown member 5 may be provided in any suitable manner.

[0027] The crown or top member 5 may include a top disc portion 31 from which an outer skirt 34 and an inner crown guidance skirt 33 extend. The crown 5 may include an orifice 30 for container content egress. The outer skirt 34 includes externally protruding features 32 which may improve grip and reduce chocking hazard, and an integrally molded frangible tamper evidence feature 6 which extends below the skirt 34. During assembly, the teeth 42 of the frangible member 6 engage complementary teeth 44 of the base member 2. Tabs 35 of the crown 5 may engage recess 15 in extension 43 so that tabs 35 and contact pads 37 of the base member 2 may resist axial load before actuation. In alternate embodiments, the axial load may be resisted in any suitable manner such as, for example, by snaps, a frangible connection and the like. Longitudinal grooves 41 on the inner surface of the inner skirt 33 engage ribs 23 on the tap 3 providing torque transfer to and alignment with the tap 3 during actuation of the resealable pull-up closure feature. In alternate embodiments, torque transfer and alignment of the crown 5 may be provided in any suitable manner such as, for example, by tabs, friction, etc.

[0028] Referring also to FIGS. 4 and 5, the resealable pull-up closure feature may be actuated by rotating the crown 5 until stopped by the contact of the tap tab 22 with the base member groove 18, which action also orients the tabs 35 with relieved surfaces 40 over which tabs 35 may longitudinally pass (FIG. 7, Block 700). The resistance of this rotation by engagement of the teeth 14, 42 subsequently shears the integrally molded or mechanically formed frangible webs 36 which had connected the crown 5 and the tamper evidence feature 6. The crown 5 may be depressed longitudinally by, for example, a uniform motion, by impact force or by the like in the direction of arrow A until physically stopped by the contact of the tap 3 flange 21 with the partially frangible member 8 (FIG. 7, Block 710). This action drives the detached band 6 over the bead 13 and the tabs 42 over the reliefs 40 making both non-retractable to their original position. The force of driving the crown 5 in the direction of arrow A may be transferred to the tap 3 and to the fragement wedges 24 through, for example, the inner skirt 33 and flange 21 so that the fragement wedges 24 are thereby driven through the partially frangible member 8. The notch 25 may permanently hold open the partially frangible member sections 9.

[0029] The fragement wedges 24 may be driven through the partially frangible member 8, by for example, an impact force or uniform movement of the crown 5 (e.g., providing either a sudden or steady force sufficient to move the crown and to fracture the partially frangible member), so that the partially frangible member 8 is pierced by the fragement wedges 24 at fragement pathways 11 and further split by the continued advancement of the inner skirt 33 of the crown 5 (FIG. 7, Block 720). Split segments 9 of the partially frangible member 8 may remain attached to the member 8 by means of a flexible shoulder 10, while not interfering with the release of the container contents. It should be realized
that driving the detached band 6 over the bead 13 and piercing the partially frangible member 8 may be performed in one motion.

[0030] The contents of the container or package to which the closure assembly 1 is affixed may be released by axially retracting the crown 5 until stopped by the interaction of contact of pads 35 with the underside of the teeth 14, and the package is released by depressing the crown 5 until stopped (FIG. 7, Block 730).

[0031] The crown 5, base 2 and tap 3 may be formed in any suitable manner such as, for example, by injection or compression molding. The crown 5, base 2 and tap members may be made of any suitable material or combination of materials such as, for example, plastic, which may provide adequate mechanical functionality and seal characteristics for the closure assembly 1. The crown 5, base 2 and tap 3 may each be made from different materials, the same materials or any combination thereof. In alternate embodiments, the each of the crown 5, base 2 and tap 3 may be made from a combination of materials through processes such as, for example, overmolding, etc.

[0032] Referring now to FIGS. 8A-10, a resealable pull-up style closure 1’ is shown in accordance with another exemplary embodiment. The closure 1’ may include a crown 5’, a tamper evidence band 6’, a shutoff or tap member 31 and a bottom or base member 21.

[0033] The base member 21 of the closure 1’ may include a top face 12’ having a skirt 7’ extending therefrom in a longitudinal direction that extends from the top of the closure 1’ to the bottom of the closure 1’. In alternate embodiments, the base member 2’ may also include a tamper evidence band, that may be similar to the band 6’, or any other suitable tamper evidence feature that engages the container to indicate whether the closure 1’ has been removed from the container. The skirt 7’ is shown as being cylindrical or having a circular cross section but in alternate embodiments, the skirt may have any suitable shape and cross-section such as, for example, square, rectangular, triangular, oval, etc. The skirt 7’ may have an opening forming a cavity so that the closure 1’ can be removably engaged with a container. The cavity of the skirt 7’ may have any suitable features to affix the closure 1’ to the container such as, for example, thread elements 39’. In alternate embodiments, the closure 1’ may be attached to the container in any suitable manner such as, for example, with snaps, locking tabs and the like. In other alternate embodiments, the base member 2’ may have contact portions to provide seal(s) between the closure 1’ and the container. In still other alternate embodiments, the crown member 5’ may be removably engaged to the container while the base member 2’ remains affixed or is of unitary construction with the container.

[0034] Opposite the skirt 7’, the base member 2’ may also include a skirt extension 43’ extending longitudinally from the top face 12’ of the base member 2’ towards the top of the closure 1’. The skirt extension 43’ is shown in the drawings as being cylindrical (e.g. with a circular cross-section) but in alternate embodiments, the skirt extension 43’ may have any suitable cross-sectional shape such as square, rectangular, triangular, oval, etc. The skirt extension 43’ may include a partially frangible member 8’ having partially frangible segments 9’ with frangement pathways 11’. The partially frangible segments 9’ may be initially pierced by a frangement wedge 24’ of the crown member 5’ and further split by the continued advancement of the crown member 5’ in the longitudinal direction of arrow A towards the face 12’ of the base member 2’. Split segments 9’ of the frangible member 8’ may remain attached to the base member 2’ via a living hinge 10’ (See also FIG. 4) while not interfering with the release of the container contents through the closure 1’. In alternate embodiments, the partially frangible segments 9’ may be contained from being released into the contents of the container in any suitable manner. The skirt extension 43’ may also include a tamper evidence bead 13’ for retaining the tamper evidence band 6’ as will be described below and a ramped surface 16’ which may aid in the assembly of the closure 1’.

[0035] The skirt extension 43’ may contact a portion of the tap 3’ and/or other alignment portion of the crown member 5’ and provide retention and guidance of the tap 3’ and crown member 5’ before, during and after actuation. The inner surface of the skirt extension 43’ above the surface 12’ of the base member 2’ may include ledges 19’ and rotation resistance features 17’ which may retain the crown member 5’ until deliberate actuation. Grooves 41’ may guide the crown member 5’ during the engagement and piercing of the partially frangible member 8’. The tap 3’ may also be retained by the ledges 19’ and may be kept from unintentional rotation apart from the crown member 5’ due to the tap flange 21’ fitting within the channel 25’. In alternate embodiments, retention of the tap 3’ and crown member 5’ may be provided in any suitable manner such as, for example, by snaps.

[0036] The tap 3’ may include a stopper 27’ for plugging the fluid release orifice 30’ of the crown member 5’. The stopper may be connected to flanges 21’ in any suitable manner such as, for example, by members 47’. Before actuation the tap flanges 21’ may rest against ledges 19’. During actuation the tap 3’ and flanges 21’ may be rotated via the crown member 5’ until the flanges 21’ are stopped by and aligned with channels 18’. The tap may be pushed in the direction of arrow A towards the surface 12’ of the base member 2’ by surface 46 of the channel 25’ and/or surface 45 of the crown member 5’. As the tap 3’ is moved in the direction of arrow A, longitudinal grooves 18’ on the inner surface of the extension 43’ may guide the tap 3’. The tap flange 21’ may snap over the tap snaps 20A and be retained by the grooves 20’ to prevent further longitudinal movement of the tap 3’. In alternate embodiments, longitudinal movement of the tap 3’ after actuation may be employed in any suitable manner.

[0037] The crown or top member 5’ may include a top disk portion 31’ from which an outer skirt 34’ and an inner crown guidance skirt 33’ extend. The crown 5’ may include an orifice 30’ for container content egress. The outer skirt 34’ may include externally protruding features 32’ which may improve grip and reduce choking hazard, and an integrally molded frangible tamper evidence feature 6’ which extends below the skirt 34’. During assembly, the teeth 42’ of the frangible member 6’ engage complementary teeth 14’ of the base member 21. Tabs 35’ of the crown 5’ may engage the recess 15’ so that tabs 35’ and contact pad 37’ of the base member 2’ may resist axial load before actuation. In alternate embodiments, the axial load may be resisted in any suitable manner such as, for example, by snaps, a frangible connection and the like.

[0038] The inner crown guidance skirt 33’ may include longitudinal ribs 23’, a retaining channel 25’ and frangement
The inner skirt 33' is shown in the Figures as being cylindrical (e.g. with a circular cross-section) but in alternate embodiments, the inner skirt 33' may have any suitable cross-sectional shape such as square, rectangular, triangular, oval, etc. The longitudinal ribs 23' may extend from the top of the closure 1' towards the bottom of the closure 1'. The ribs 23' may have any suitable length for engaging the ledges 19', recess 17' and grooves 41' of the base member 21. Before actuation the ribs 23' may be seated on the ledges 19' inside the rotation resistance recess 17'. The recess 17' may prevent unintentional rotation of the crown member 5'. The ribs 23' may engage longitudinal grooves 41' in the base member 2' when the crown member 5' is rotated and advanced longitudinally in the direction of arrow A (towards the surface 12' of the base member 2') to puncture the frangible member 8'. The retaining channel 25' may hold the broken frangible segments 9' open after actuation to allow egress of the container contents. The retaining channel 25' may also engage the tab flanges 21' on the tab 3' providing torque transfer to and alignment with the tab 3' during actuation of the resealable pull-up closure feature. In alternate embodiments, torque transfer and alignment of the tab 3' may be provided in any suitable manner such as, for example, by tabs, friction, etc.

In operation, the resealable pull-up closure 1' may be actuated from an initial configuration, as can be seen in FIG. 9. Actuation may occur by rotating the crown 5' until stopped by the contact of the ribs 23' with the base member groove 41', and/or the contact of the tab flanges 21' with the base member groove 18', which action also orients the tabs 35' with relieved surfaces 40' over which tabs 35' may longitudinally pass (FIG. 7, Block 700). The resistance of this rotation by engagement of the teeth 14', 42' subsequent shears the integrally molded or mechanically formed frangible webs 36' which had connected the crown 5' and the tamper evidence feature 6'. The crown 5' may be depressed longitudinally by, for example, a uniform motion, by impact force or the like in the direction of arrow A until physically stopped by the contact of the tab 3' flanges 21' with the partially frangible member 8' (FIG. 9, Block 710). This action drives the detechd band 6' over the bead 13' and the pads 42' over the relief 40' making both non-retractable to their original position, as can be seen in FIG. 9. The force of driving the crown 5' in the direction of arrow A causes the frangement wedges 24' to be driven through the partially frangible member 8'. The retaining channel or notch 25' may hold open the partially frangible member sections 9'.

The fragement wedges 24' may be driven through the partially frangible member 8', by for example, an impact force or uniform movement of the crown 5' (e.g. providing either a sudden or steady force sufficient to move the crown and to fracture the partially frangible member), so that the partially frangible member 8' is pierced by the fragement wedges 24' at fragement pathways 11' and further split by the continued advancement of the inner skirt 33' of the crown 5' (FIG. 7, Block 720). Split segments 9' of the partially frangible member 8' may remain attached to the member 8' by means of a flexible shoulder 10', while not interfering with the release of the container contents. It should be realized that driving the detached band 6' over the bead 13' and piercing the partially frangible member 8' may be performed in one motion.

The contents of the container or package to which the closure assembly 1' is affixed may be released by axially retracting the crown 5' until stopped by the interaction of contact of pads 35' with the underside of the teeth 14', and the package is resealed by depressing the crown 5' until stopped (FIG. 7, Block 730).

It should be understood that the foregoing description is only illustrative of the embodiments. Various alternatives and modifications can be devised by those skilled in the art without departing from the embodiments. Accordingly, the present embodiments are intended to embrace all such alternatives, modifications and variances that fall within the scope of the appended claims.

1. A method of opening a closure comprising: rotating a crown member of a closure; depressing the crown member toward a base member of the closure; and piercing at least one frangible segment of a partially frangible member of the base member.

2. The method of claim 1, wherein a content of a container is released through a passage resulting from at least piercing the at least one frangible segment.

3. The method of claim 2, wherein the resulting passage is resealable.

4. The method of claim 1, wherein the crown member is rotated with respect to the base member to allow form axial movement of the crown member.

5. The method of claim 4, wherein rotating the crown member disengages locking mechanisms of the crown and base members.

6. The method of claim 1, wherein piercing the partially frangible member of the base member comprises impacting the crown on a surface.

7. The method of claim 1, wherein a tab member is driven by the crown member to pierce the partially frangible member.

8. The method of claim 1, wherein the crown member pierces the partially frangible member.

9. A closure comprising: a crown member; a base member attached to the crown member, the base member having a partially frangible member; and a tab member retained by the crown member and base member; wherein the crown member is configured to move axially with respect to the base member.

10. The closure of claim 9, wherein the crown member is further configured to drive the tap member through the partially frangible member.

11. The closure of claim 9, wherein the crown member is configured to pierce the partially frangible member.

12. The closure of claim 9, wherein the frangible member includes segments hingably attached to the base member.

13. The closure of claim 9, wherein the crown member further comprises an outer frangible or deformable skirt portion for minimizing unintentional actuation of the crown member.

14. The closure of claim 9, wherein a skirt of the base member engages a container for removably attaching the closure to the container, the skirt having contact portions to provide seal(s) between the closure and the container.

15. The closure of claim 9, wherein the closure is configured so the crown member remains engaged with the base member after actuation to prevent a content of an attached container from escaping through the closure.
16. The closure of claim 9, wherein the crown and base members each include locking mechanisms which when engaged minimize unintentional actuation of the crown member.

17. A closure comprising:
   a base member; and
   a crown member slidably engaged with the base member,
   the crown member being configured to drive a tap member through a partially frangible member of the base member.

18. The container closure of claim 17, wherein the tap member is slidably engaged within a cavity of the base member and retained by the crown member, the tap member being configured to snap into a groove of the base member for retaining the tap member upon actuation of the crown and tap members.

19. The closure of claim 17, wherein the frangible member includes segments hingably attached to the base member.

20. The closure of claim 17, wherein the crown member further comprises an outer frangible or deformable skirt portion for minimizing unintentional actuation of the crown member.

21. The closure of claim 17, wherein axial movement of the crown member after actuation interacts with the tap member to prevent or allow passage of the content of the attached container to pass through the closure.

22. The closure of claim 17, wherein a skirt of the base member engages a container for removably attaching the closure to the container, the skirt having contact portions to provide seal(s) between the closure and the container.

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